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## Replacing the Antipersonnel Landmine in the Force Protection Role



by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature: \_\_\_\_\_

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## Abstract of

### **Replacing the Antipersonnel Landmine in the Force Protection Role**

Although FM 20-32 prescribes protective minefields to provide close-in protection during the enemy's final assault, the U.S. military will soon be banned from using antipersonnel landmines (APL) to fill this force protection role. The magnitude of human suffering resulting from landmines caused the world humanitarian and diplomatic communities to join forces in September 1997 to produce the Ottawa Convention, a treaty that bans all APLs. That same month, the President directed DoD to develop antipersonnel landmine alternatives for use outside Korea by 2003 and for the Korean Theater by 2006. Once satisfactory APL alternatives have been fielded, the United States will sign the Ottawa Convention.

Lead for this effort fell to the Under Secretary of Defense for Acquisition and Technology [USD(A&T)]. Based on preliminary research, the Under Secretary issued a 1997 report focused on integrating technology, combat forces, and military doctrine. The concept was that any lethal APL alternatives would incorporate real-time surveillance, precision fire, and man-in-the-loop command and control systems to cue engagement. Given the DoD interest in nonlethal weapons, it is only natural that this technology would also be among the options examined to satisfy the force protection role historically played by the APL.

The die has been cast. Early in the 21<sup>st</sup> century, high-tech nonlethal and man-in-the-loop defensive weapon systems will fill the limited remnants of the 20<sup>th</sup> century antipersonnel landmine force protection role not made obsolete by operational doctrine and precision fire, standoff weapons.

## Introduction

Although FM 20-32 prescribes protective minefields to "provide the defender with close-in protection during the enemy's final assault,"<sup>1</sup> the U.S. military will soon be banned from using antipersonnel landmines (APL) to fill this force protection role. CNN has brought the suffering of innocent civilians torn apart by landmines into living rooms around the world and contributed to the globalization of world opinion against these devices. As observed by Secretary of State Madeleine K. Albright in *Hidden Killers 1998, The Global Landmine Crisis*, as the 20<sup>th</sup> century wanes, 90 percent of the weapons' casualties are civilians.<sup>2</sup> The magnitude of human suffering resulting from landmines has caused the world's humanitarian and diplomatic communities to join forces in a concerted effort to outlaw the APL.

Coincidentally, the end of breakup of the Soviet Union resulted in a significant increase in regional conflict and left the United States the world's only military super power and the apparent global peace-keeper and protector of human rights. This role frequently places U.S. forces in harm's way, raising the question of how to protect the force in the absence of antipersonnel landmines.

Still, the die has been cast. **Early in the 21<sup>st</sup> century, high-tech nonlethal and man-in-the-loop defensive weapon systems will fill the limited remnants of the 20<sup>th</sup> century antipersonnel landmine force protection role not made obsolete by operational doctrine and precision fire, standoff weapons.**

## Background

While rudimentary mines have been used almost since the development of gunpowder, World War II saw the first significant use of landmines. Anti-tank mines were developed to slow the armored onslaught, and antipersonnel landmines were interspersed to complicate the removal of these barriers. While millions of landmines were used throughout WWII, their use was "never decisive in major operations."<sup>3</sup>

Next used extensively in Korea, U.S. mines were so often re-employed by the enemy that friendly mines caused more American casualties than any other weapon.<sup>4</sup> In the words of Marine Lieutenant General B. E. Trainor (Ret), a rifle-platoon leader in that conflict, "to this day, I cannot walk across an open field without an eerie feeling that death lurks in the tranquility."<sup>5</sup> Recognizing the indiscriminate havoc caused by mines, particularly the maiming of civilians, the U.S. military proposed in February 1952 to "end reliance on non-self-destructing APLs."<sup>6</sup>

Used extensively for protective measures throughout the conflict, Vietnam marked a sinister turning point in the use of APLs because of the sheer number used and the cavalier ways in which scatterable mines were sown by U.S. forces. By default, Vietnam "appears to have set the precedent because, thereafter, APLs have been used in both orthodox and irregular conflicts, extensively and generally irresponsibly."<sup>7</sup> Ultimately, APL usage diversified, and the mine became one of the most deadly weapons of the twentieth century.<sup>8</sup>

The formal process to ban APLs began in 1980 with the *Geneva Convention on Prohibitions or Restrictions on the Use of Certain Conventional Weapons which may be Deemed to be Excessively Injurious or to have Indiscriminate Effects* (CCW). Still, this agreement merely codified what was, at that time, common practice among NATO forces.<sup>9</sup>

Non-governmental organizations (NGO) such as the International Committee of the Red Cross (ICRC) were dissatisfied with the CCW and, in the ensuing years, began to push for a total ban on antipersonnel landmines. Over time, the diplomatic community shifted its thinking in line with the NGO perspective.

The State Department report, *Hidden Killers: The Global Landmine Crisis, 1994*, highlighted the magnitude and seriousness of the problem. The report indicated that approximately 100 million landmines were implanted in 64 countries and that 500 people fell victim to landmine explosions every week. It went on to postulate that APLs, which often remain in-place and lethal long after armed conflict has ceased, were killing more children than soldiers. The report also highlighted that the long-term, socio-economic impacts included making "entire communities uninhabitable . . . , driv[ing] people from their land . . . , [and] . . . keeping refugees from returning home."<sup>10</sup> Although subsequent analyses have indicated that the magnitude of the problem had been greatly overstated,\* world opinion would not be assuaged by an estimate of 50 million versus 100 million mines waiting to shatter innocent lives.

Given these findings, President Clinton's National Security Strategy of engagement, democratization, and economic globalization led quite naturally to a U.S. landmine policy aimed at enhancing economic viability and stability. This included funding for the U.S. Demining Assistance Program, a unilateral moratorium on antipersonnel landmine exports, and support for ratification of the CCW.<sup>11</sup>

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\* The true magnitude of the landmine problem is subject to debate. The State Department's *HIDDEN KILLERS 1998, The Global Landmine Crisis* report estimates that its 1994 report overstated the numbers of mines by 30-50 percent. Only a small portion of this reduction can be attributed to international demining efforts. For another interesting although arguably one-sided analysis of this issue see *Landmines, Lies, and Other Phenomena*, written by MG Jarvis D. Lynch and published in the May 1998 version of Proceedings (p. 45).

In 1996 President Clinton committed to the elimination of non-self-destructing U.S. APLs by the end of 1999. The one exception was to be those devices required for South Korean defense. In compliance with this declaration, the last of a 3.3 million mine inventory was destroyed at the Crane Army Ammunition Activity on 1 July 1998.<sup>12</sup>

Still, as stated earlier, the CCW did not go far enough to satisfy growing international humanitarian concerns. In particular, it did not address dual-purpose mines nor did it outlaw smart-mines. As a result, a conference was held in Ottawa in 1996 to address this issue. While attended by only 50 countries and unable to gain the support of any of the permanent UN Security Council members, it called for a subsequent meeting in 14 months to sign a treaty to ban all antipersonnel landmines.<sup>13</sup>

The follow-on, June 1997 Brussels meeting yielded a declaration signed by 97 countries, and in September of that year 131 nations participated in drafting the Ottawa Convention. This treaty eliminates exceptions and loopholes, banning all APLs, to include self-destructing devices.<sup>14</sup> The United States withdrew from the September effort based on two overriding considerations. First, no alternative to the APL was available to meet the security requirements of the significantly out-manned American force stationed along the Korean DMZ. Second, U. S. ratification will require the destruction or significant modification of its modern, self-destructing,\* scatterable mine systems because they incorporate

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\* It is interesting to note that the inclusion of self-neutralizing/self-destructing (SN/SD) mines in the ban was based more on military than humanitarian considerations. Because of their cost, only economically powerful nations have such smart mines. Their exemption from the landmine ban would, many believe, increase the already considerable military advantage possessed by those nations. Broad based international support for the APL ban came therefore to depend on the inclusion of smart mines. "The fact that a well-designed SN/SD anti-personnel landmine would leave little or no residual hazard was irrelevant."<sup>15</sup>

a mixture of anti-tank and antipersonnel munitions.<sup>16</sup> The United States was not alone in their opposition to the agreement—other notable non-signatories included Russia and China.

That same month the President directed DoD to develop antipersonnel landmine alternatives, to include mixed anti-tank systems, for use outside Korea by 2003 and for the Korean Theater by 2006. Once satisfactory APL alternatives have been fielded, the United States will sign the Ottawa Convention.<sup>17</sup>

### **Discussion**

Force protection is a broadly defined term encompassing the “planned and integrated security program designed to protect soldiers, facilities, and equipment in all locations and situations.”<sup>18</sup> Antipersonnel landmines fill only a limited range of the overall force protection requirement. Field Manual 20-32, Mine/Countermining Operations, revised in May 1998 to accommodate current APL restrictions, defines protective minefields as those “employed to protect soldiers, equipment, supplies, and facilities from enemy attacks or other threats. . . . Protective minefields serve two purposes. First, they impose a delay on an attacker . . . . Second, they break up the enemy assault to complete its destruction.”<sup>19</sup> It is within this concept of landmine doctrine and force protection that this paper examines how the U.S. military will accommodate the elimination of APLs.

Recent history has repeatedly demonstrated force vulnerability and emphasized the need for improved force protection. The worst terrorist attack on U.S. military personnel was the 1983 Beirut bombing which took the lives of 241 U.S. servicemen. Still, it was the far less destructive (in terms of lives lost) 1996 terrorist bomb in Dhahran, Saudi Arabia, that

made the phrase “no more Kobar Towers” the battle cry for increased emphasis on force protection.

One solution used in the Persian Gulf for those forces that could not be evacuated was “an elaborate set of automated sensors called the Tactical Automated Security System.”<sup>20</sup> Since that time high-tech approaches to force protection have characterized most innovation on the issue. More to the point of this analysis is the recognition that the force protection challenge was rapidly shifting into the counter-terrorism arena. Because this is not a role for which APLs are well suited, these devices are losing their force protection utility for U.S. forces.

In the wake of the Kobar Towers bombing, Secretary of Defense Perry chartered the Downing Commission to investigate the bombing. Since retired General Wayne A. Downing’s report has shaped subsequent force protection initiatives, his findings provide significant insight into the state of thought on the broad issue of force protection.

Based on the Commission’s findings, Secretary Perry took steps to issue DoD-wide, force protection standards; enhance local commanders’ operational control over force protection; designate the Chairman of the Joint Chiefs of Staff as the principal advisor for force protection activities; and improve the use of available intelligence and intelligence collection capabilities. Secretary Perry also took several actions to raise the visibility of force protection in the Joint Requirements Oversight Council arena and to increase its funding within the Planning, Programming, and Budgeting System. The Secretary determined that DoD needed to “expedite the adoption of new advanced technologies to meet force protection needs.”<sup>21</sup> These actions, while reflecting a commitment to meeting the force protection challenge, suggested that specific solutions remained elusive.

Within DoD, lead for this effort fell to the Under Secretary of Defense for Acquisition and Technology [USD(A&T)]. Based on preliminary research, the Under Secretary issued a 1997 report focused on integrating "existing and near-future technologies, combat forces, and military doctrine." The belief was that on-going efforts in the areas of information dominance and precision fire platforms could be "leveraged into area denial applications. However, additional resources will be required." The concept was that any lethal APL alternatives would incorporate real-time surveillance, precise firepower to immediately suppress enemy forces, and "man-in-the-loop" command and control systems to cue engagement. These efforts also "determined that additional military force structure is the only effective near-term alternative to the use of APL."<sup>22</sup>

Still, this was not DoD's first look at the problem. The Institute for Defense Analysis completed a quick-response study in 1994 for the Office of the Assistant Secretary of Defense for Special Operations and Low Intensity Conflict. The study modeled the military utility of landmines under a series of diverse scenarios and indicated that mines held significantly less utility than previously believed. Conventional weapon systems such as precision artillery, multiple-launch rocket systems, and armored fighting vehicles were demonstrated to be effective, although expensive substitutes for minefields. Overall, the results suggested "that concerns for lost military utility in high intensity conflict need not preclude consideration of any form of landmine arms control."<sup>23</sup>

So what progress has been made to identify APL replacements? "The U.S. Army's Raptor Intelligent Combat Outpost (ICO), formerly known as the Intelligent Minefield (IMF), is an autonomous system intended for unmanned terrain domination."<sup>24</sup> ICO consists of anti-armor munitions linked by the counter-mobility remote-control system (CIRCE), a

system of fiber-optic monitors that relays information to a controller. Designed as an anti-armor and force multiplier capability, it could be modified for the antipersonnel, force protection role. With the controller facilitating the required man-in-the-loop verification function, such a system with antipersonnel munitions could provide force protection while meeting the terms of the landmine treaty.<sup>25</sup>

Given the recent DoD interest in nonlethal weapons, it is only natural that this technology would be among the options examined to satisfy the force protection role historically played by the APL. In September 1997, the Joint Staff and the USD(A&T) co-sponsored the first Department of Defense Force Protection Equipment Demonstration (FPED) at the Quantico Marine Corps Base. The demonstration was designed to provide military leadership and other decision-makers “the opportunity to observe, and become familiar with, commercial off-the-shelf force protection equipment available for procurement or testing within 90 days . . .” This highly successful event attracted 185 exhibitors and showcased an impressive array of devices to include fence sensors, night-vision and daylight optics systems, blast mitigation items, and access control equipment.<sup>26</sup>

While much work remains to be done to develop many of the nonlethal force protection concepts, one item at the FPED was particularly intriguing. The DKL LifeGuard, produced by DC-based Dielectrokinetic Laboratories, is a light-weight, hand-held device. Designed “to locate persons trapped in burning buildings, beneath the rubble of a collapsed building, lost in deep woods, or washed overboard from a ship . . .,” the DKL LifeGuard detects the ultra-low frequency (ULF) electromagnetic energy produced by a beating heart. Operating silently and passively, it can pinpoint the location of a person “through metal walls, sand berms, and deep water . . . . The latest version of the device, the Model 3

LifeGuard, is said to be capable of detecting a person in an uncluttered environment out to a range of 500 meters.” The device can distinguish between humans and other primates and can track “individual movements, since each human heart produces a distinctive signal.”<sup>27</sup> The device’s unique capabilities are directly applicable to the force protection problem and DKL is now developing a design specifically for security applications such as perimeter defense.

The U.S. Army Engineer School Maneuver Battle Lab has also investigated several landmine alternative technologies. These include “tunable munitions” that incorporate nonlethal technology and “selective energy” munitions which are nonlethal when in the autonomous mode but which possess lethal capability for man-in-the-loop applications. A “progressive-penalty” variation provides a third intriguing option. Designed to temporarily incapacitate intruders, these “munitions start with a nonlethal response but progress to an ultimately fatal penalty for continued perseverance in a particular direction.”<sup>28</sup> Such devices pose little danger to innocent civilians who should be quickly deterred by the initial, low-energy effects. While probably not considered within the framework of the Ottawa Convention, each should be legitimate under that regime.

Numerous doctrinal innovations and technological concepts continue to be explored within the U.S. Army under the *Force XXI* and *Army After Next* umbrella. Advanced weapons are making the historical battlefield “spatial concepts” obsolete. Future forces are projected to be widely dispersed for enhanced survival on an “empty battlefield.” Nonlinear operational concepts will reduce the requirement for force protection at the “front,” while deep strike weapons remove the rear area from the range of enemy forces. Other efforts “seek to incorporate chameleon-like camouflage . . . into the Soldier Integrated Protection

Ensemble system.”<sup>29</sup> In fact, a 1994 Advanced Research Projects Agency report coined the term *Invisible Soldier Image Avoidance and Signature Reduction* for a concept to “make the individual soldier invisible, day or night, to the whole range of battlefield sensors across the electromagnetic spectrum.”<sup>30</sup>

Still, the antipersonnel landmine ban is not without its detractors. The strongest resistance is not with the alternatives under consideration, but rather with the logic of the ban. “With landmine arms control . . . the United States is being asked to reduce or constrain a military capability to help address a humanitarian problem, and one which the United States neither created, nor benefits as directly from resolving as do many other states.”<sup>31</sup> Furthermore, “the humanitarian problem is primarily the result of NSD [non-self-destructing] APL used by undisciplined insurgent forces . . . [and] there is negligible risk that our mines will be dangerous to civilians because SD [self-destructing] mines are installed shortly before or even during a battle and self-destruct within a short time after the battle is over.”<sup>32</sup> Finally, the fact that the United States does not export any APL makes it unlikely that U.S. mines will contribute to the insurgent-precipitated humanitarian crisis.

Opposition is also based on the belief that the APL ban “is a treaty which cannot be verified or enforced. Anyone can make a landmine. Costing as little as \$3 to produce, who believes that guerilla and other irregular forces will not continue to use mines as force multipliers? Who is going to stop them and how?”<sup>33</sup> Treaty compliance was addressed in detail in IDA Paper P-3001, *Landmine Arms Control*, May 1996. That report discussed the two broad areas of treaty monitoring and enforcement, and international stigmatization associated with non-compliance. The IDA analysis, while beyond the scope of this paper, suggests that treaty compliance, particularly by non-state elements, will be problematic.<sup>34</sup> It

is one thing to give up a military capability on both sides of a conflict. It is quite another to do so when common sense indicates that the sacrifice will be unilateral and could lead to otherwise avoidable casualties in future military operations.

Research previously discussed in this paper has demonstrated that "prudent and responsible APL usage reduces casualties and increases our chances of accomplishing our mission." Based on these facts, the Joint Chiefs of Staff and all the Commanders-in-Chief have written to the Chairman of the Senate Armed Services Committee "strongly urging that the US retain the right to use self-destructing APL."<sup>35</sup> Even an ICRC sponsored study of the utility of mines concluded that "no alternative fulfills the military requirement in the way that antipersonnel . . . mines do . . ."<sup>36</sup>

Mines provide critical force protection while forces are being introduced into a theater of war. The U.S. doctrine of force projection means that U.S. forces can anticipate facing numerically superior foes at the beginning of any future major conflict. As DoD plans to face the "first battle on the defensive," antipersonnel mine defenses play an important role in reducing casualties.<sup>37</sup>

Even those who accept that the landmine ban will be implemented recognize serious impediments. Because APL and anti-tank mines are intermixed in several modern U.S. mine systems, "banning the use of SD APL effectively bans a large portion of our anti-tank mines as well."<sup>38</sup> For perspective, LTC Yates' 1996 Army War College Strategy Research analysis of the landmine dilemma suggests that removal of the antipersonnel landmines from the current U.S. Volcano Mine System inventory would cost approximately \$180 million.

A common attribute of alternatives to APL is the increase in manpower required to operate those systems. Direct and indirect fire weapons systems and man-in-the-loop area

denial munitions systems all require more human intervention than mine fields. Nonlethal systems present even more requirements for direct human intervention. Nonlethal systems that produce prisoners create long-term security and logistical demands. Systems that simply block penetration allow enemy soldiers to continue to be a threat until they successfully thwart the force protection barrier and engage friendly forces on their terms. Furthermore, "many nonlethal options fail to meet the psychological deterrent criteria."<sup>39</sup> Such weapons, unless capable of dealing with a large number of intruders, might be overwhelmed by a large, determined force willing to absorb nonlethal injuries.

Finally, while effective APL replacements may be technically possible, they have not yet been fully designed or fielded. Given the lead-time required to accomplish such a task within the DoD acquisition framework, they will not be available in significant quantities by 2006. At a minimum, U.S. ratification of the Ottawa Convention should therefore be delayed.

### **Conclusions**

The question is not if the U.S. military can provide force protection in the absence of antipersonnel landmines. American values will continue to make force protection a top priority. Nor is it whether the military will soon give up its APLs. There is little reason to believe that U.S. policy on their elimination will be reversed.

For the United States, the questions are how to achieve the best possible treaty compliance and how to fill the near-term force protection requirement while battlespace dominance and nonlethal weapons are perfected. In this era of downsized budgets and expanding missions, the effectiveness and efficiency of the solutions to those problems will

shape both tomorrow's decisions to employ U.S. ground forces and the safety of our soldiers as they implement U.S. policy through the exercise of military power.

It is in the U.S. military's interest to ban APLs. The State Department fact sheet, *U.S. Initiatives for Demining and Landmine Control*, pointed out that "anti-personnel landmines are the weapon of choice for many governments and insurgent groups . . . [because they are] cheap, easy to manufacture and use, difficult to detect, and expensive and dangerous to remove."<sup>40</sup> Because landmine countermeasures have not kept pace with landmine technology, the weapon "provides one area where the least technically developed combatant can compete with the most developed adversary."<sup>41</sup> In the realm of APLs, the United States holds no significant, asymmetrical advantage and should therefore support their elimination.

Undeniably, treaty compliance will be problematic. It would be naive to expect terrorists and guerillas to forego the use of a cheap and easily produced system that serves their purposes so well given the vast military disparities that exist between them and modern military forces. Still, the Convention will slow innovation and production. Even imperfect compliance is preferable to the current proliferation and widespread use of APLs.

The United States will not be giving up a significant military capability when it eliminates the APL. The USD(A&T) has found that the APL "operational requirements . . . are not well qualified, and hence, no analytical basis presently exists for selecting a specific APL alternative for development."<sup>42</sup> It is anticipated that the United States will continue to engage in limited peace operations in the foreseeable future, but these are not activities in which APLs can be used legitimately or effectively. Furthermore, U.S. military doctrine no longer supports the WWII type of land warfare where APL-based force protection would be necessary to protect large numbers of ground troops in hostile territory. With the exception

of the DMZ in Korea, APLs do not satisfy a significant, current U.S. military requirement. It is no accident that APL operational requirements are not well defined. There will be no direct replacement for the antipersonnel landmine because such devices were developed for a style of protracted, ground warfare which the United States no longer plans to fight.

The multitude of operations for which our countries now employ military force is unlikely to decrease in the foreseeable future. The proliferation of terrorism, coupled with the American public's aversion to casualties, ensures this issue will remain highly visible. Humanitarian concerns will continue to drive military innovation, to include force protection concerns, toward nonlethal technologies. Still, few of the many, current force protection initiatives are focused specifically on the issue of replacing the APL. The Vietnam Conflict saw the last widespread American use of antipersonnel landmines, and the soldiers of that generation are quickly disappearing from our ranks. Since that war, weapons, doctrine, and national values have evolved to a point where tomorrow's company commanders will not even consider antipersonnel mines when developing force protection plans. APLs won't be within the context of their frame of reference.

The U.S. military will eliminate its antipersonnel landmines (by 2006 if possible), but no single device or concept will provide a direct replacement in the force protection role. In an evolutionary process, a combination of weapon technology, combat forces, and doctrine will compensate for the elimination of APLs. The lesson for tomorrow's military leaders is that in the near future, lethal, precise standoff weapons and nonlethal force protection devices such as the DKL LifeGuard will be employed by a generation of soldiers who will have never contemplated the use of APLs. Furthermore, they will do so on missions that earlier generations thought required antipersonnel landmines to protect the force.

## NOTES

<sup>1</sup> Department of the Army, Mine/Countermine Operations (FM 20-32) Washington, D.C.: 1998), 2-2.

<sup>2</sup> Department of State, Bureau of Political-Military Affairs, HIDDEN KILLERS 1998, The Global Landmine Crisis (Washington: 1998), Secretary's opening statement.

<sup>3</sup> Dipanker Banerjee, "Eliminating Anti-Personnel Landmines," Asian Defense Journal, March 1998, 7.

<sup>4</sup> Ibid., 7.

<sup>5</sup> Bernard E. Trainor, "Land Mines Saved My Life," The New York Times, 28 March 1996, 25, quoted in Jarvis D. Lynch, "Landmines, Lies, and Other Phenomena," Proceedings, May 1998, 44.

<sup>6</sup> Gregory L. Bier, "Antipersonnel Landmine Policy and Implications," Engineer, April 1998, 27.

<sup>7</sup> Centre for Defense Studies. The Military Utility of Landmines.....?, ed. by Dr. Chris Smith (King's College, University of London: June 1996, 15-16.

<sup>8</sup> Banerjee, 7.

<sup>9</sup> "Convention on Prohibitions on the Use of Certain Conventional Weapons Which May be Deemed to be Excessively Dangerous or to have Indiscriminate Effects," adopted at Geneva, 10 October 1980, quoted in Paul W. Fredenburg, "The Banning of the Anti-Personnel Landmine," Canadian Defense, Winter 1997, 5.

<sup>10</sup> Warren Christopher, "Hidden Killers: U.S. Policy on Anti-personnel Landmines," DISAM Journal, Summer 1995, 81.

<sup>11</sup> Christopher, 82.

<sup>12</sup> Deborah Rosenblum, "Implementation of U.S. Anti-Personnel Landmine Policy," DISAM Journal, Summer 1998, 96-97; Clair F. Gill, "Clear the Way (U.S. Anti-Personnel Landmine Policy)," Engineer, December 1996, front cover.

<sup>13</sup> Paul W. Fredenburg, "The Banning of the Anti-Personnel Landmine," Canadian Defense, Winter 1997, 6.

<sup>14</sup> Banerjee, 8.

<sup>15</sup> Fredenburg, 5-6.

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<sup>16</sup> Bier, 27.

<sup>17</sup> Rosenblum, 97.

<sup>18</sup> U.S. Army Field Manual 100-23, Peace Operations (Washington: Headquarters Department of the Army, December 1994), 106, quoted in Walter E. Kretchik, "Force Protection Disparities," Military Review, July/August 1997, 73.

<sup>19</sup> FM 20-32, 2-2 – 2-3.

<sup>20</sup> Otto Kreisher, "To Protect the Force," Air Force Magazine, November 1998, 30-32.

<sup>21</sup> William J. Perry, "Force Protection: Hardening the Target," Defense, Issue 6, 1996, 15.

<sup>22</sup> Department of Defense, Report to the Secretary of Defense on the Status of DoD's Implementation of the U.S. Policy on Anti-Personnel Landmines (Washington: 1997), 7.

<sup>23</sup> Institute for Defense Analysis, The Military Implications of Landmines: Implications for Arms Control, D-1559, (Alexandria, VA: June 1994), 43-71.

<sup>24</sup> Mark Hewish and Rupert Pangelley, "In Search of a Successor to the Anti-Personnel Landmine, Non-Lethal Weapons, Precision Weapons, and Close Surveillance," Jane's International Defense Review, March 1998, 37.

<sup>25</sup> James G. May, "New Technology Required to Implement U.S. Anti-Personnel Landmine Policy," (Unpublished Research Paper, U.S. ARMY War College, Carlisle Barracks, PA: 1998), 11.

<sup>26</sup> John G. Roos, "Opening Blast, Inaugural Force Protection Equipment Demo Showcases Scores of Potential Fast-Track Procurement Items," Armed Forces Journal, November 1997, 20-21.

<sup>27</sup> Ibid., 20.

<sup>28</sup> Hewish, 35.

<sup>29</sup> Robert J. Bunker, "Advanced Battlespace and Cybermaneuver Concepts: Implications for Force XXI," Parameters, Autumn 1996, . <<http://carlisle-www.army.mil/usawc/parameters/>>, 1-3.

<sup>30</sup> Advanced Research Projects Agency, "Report of the Senior Working Group on Military Operations Other than War (OOTW), May 1994, 24, quoted in Robert J. Bunker, "Advanced Battlespace and Cybermaneuver Concepts: Implications for Force XXI," Parameters, Autumn 1996, <<http://carlisle-www.army.mil/usawc/parameters/>>, 3.

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<sup>31</sup> Institute for Defense Analysis, The Military Implications of Landmines: Implications for Arms Control, D-1559, (Alexandria, VA: June 1994), 8.

<sup>32</sup> Frederick L. Clapp, Jr, "US Anti-Personnel Landmine Policy vis-à-vis the Ottawa Anti-Personnel Landmine Treaty," (Unpublished Research Paper, U.S. ARMY War College, Carlisle Barracks, PA: 1998). 25-26.

<sup>33</sup> "The Ottawa Landmine Ban: Hardly 'Historic'," published by The Center for Security Policy as Decision Brief No. 97-D 187, 4 December 1997, quoted in Lynch, 48.

<sup>34</sup> Institute for Defense Analysis, Landmine Arms Control, P-3001, (Alexandria, VA: May 1996), 5-33.

<sup>35</sup> Shalikaskvili et al, "Letter to Senator Strom Thurmond," 10 July 1997, quoted in Clapp, 27.

<sup>36</sup> Kevin Cahill, ed., Clearing the Fields: Solutions to the Global Land Mines Crisis (New York: BasicBooks, 1995), 38, quoted in Thomas Barry Supplee, "Not Without risk: Operational Analysis of a Landmine Ban," (Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998), 11.

<sup>37</sup> Clapp, 29.

<sup>38</sup> Ibid., 29.

<sup>39</sup> Byran Green, "Alternatives to Antipersonnel Mines," Engineer, December 1996, 12.

<sup>40</sup> Christopher, 82.

<sup>41</sup> Vernon Lowery, "Initial Observations by Engineers in the Gulf War," Engineer, October 1991, quoted in James G. May, 1-2.

<sup>42</sup> Department of Defense, Report to the Secretary of Defense on the Status of DoD's Implementation of the U.S. Policy on Anti-Personnel Landmines (Washington: 1997), 7.

## BIBLIOGRAPHY

- Banerjee, Dipankar. "Eliminating Anti-Personnel Landmines." Asian Defense Journal, March 1998, 6-8.
- Bass, Harold C. "Non-Lethal Weapons and Conventional War: Facing the Commander's Issues and Dilemmas." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998.
- Bier, Gregory. "Antipersonnel Landmine Policy and Implications." Engineer, April 1998, 27.
- Buchanan, Nancy. "Mine Warfare from a Different Perspective." Armada International, February/March 1995, 20-26.
- Buckley, Edward T. Jr., Franke, Henry G., and Milton, Fenner A. "Army After Next Technology: Forging Possibilities into Reality." Military Review, March-April 1998, <<http://www-cgsc.army.mil/milrev/>> (30 April 1999).
- Bunker, Robert J. "Advanced Battlespace and Cybermaneuver Concepts: Implications for Force XXI." Parameters, Autumn 1996. <<http://carlisle-www.army.mil/usawc/parameters/>> (30 April 1999).
- Centre for Defense Studies. The Military Utility of Landmines.....?, ed. by Dr. Chris Smith, June 1996.
- Christopher, Warren. "U.S. Policy on Anti-Personnel Landmines." Defense International Security Assistance Management Journal, Summer 1995, 81-84.
- Clapp, Frederick L. Jr. "US Anti-Personnel Landmine Policy vis-à-vis the Ottawa Anti-Personnel Landmine Treaty." Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1998.
- Coyne, Thomas P. "Readiness and Force Protection." TIG, November-December 1996, 8-9.
- Douglas, Michael W. "Rules of Engagement for Non-Lethal Weapons." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998.
- Fedenburg, Paul W. "The Banning of the Anti-Personnel Landmine." Canadian Defense Quarterly, Winter 1997, 5-9.
- Gill, Clair, F. "Clear the Way." Engineer, December 1996, cover.
- Green, Bryan. "Alternatives to Antipersonnel Mines." Engineer, December 1996, 11-13.

- Hewish, Mark and Pangelley, Rupert. "In Search of a Successor to the Anti-Personnel Landmine, Non-Lethal Weapons, Precision Weapons, and Close Surveillance." Jane's International Defense Review, March 1998, 30-37.
- Institute for Defense Analysis. The Military Implications of Landmines: Implications for Arms Control (IDA D-1559). Alexandria, VA: June 1994.
- Institute for Defense Analysis. Landmine Arms Control (IDA P-3001). Alexandria, VA: May 1996.
- Lynch, Jarvis D. "Landmines, Lies, and Other Phenomena." U.S. Naval Proceedings, May 1998, 44-49.
- Kreisher, Otto. "To Protect the Force." Air Force Magazine, November 1998, 30-34.
- Kretchik, Walter E. "Force Protection Disparities." Military Review, July/August 1997, 73-78.
- May, James G. "New Technology Required to Implement U.S. Anti-Personnel Landmine Policy." Unpublished Research Paper, U.S. ARMY War College, Carlisle Barracks, PA: 1998.
- Martinez, Hilda and Tepas, Lisa. "Army Reserve Role in Force Protection," Army Logistician, March-April 1998. <<http://www.almc.army.mil/orgnization/alog/alog.htm>> (30 April 1999).
- Perry, William J. "Force Protection: Hardening the Target." Defense, Issue 6, 1996, 2-16.
- Roberts, Mark J. "Hardening Overseas Presence: Force Protection." JFQ, Winter 1996-97, 117-120.
- Rokosz, Ronald F. and Hash, Charles H. "Changing the Mindset—Army Antiterrorism Force Protection." JFQ, Autumn/Winter 1997-98, 110-117.
- Roos, John G. "Opening Blast, Inaugural Force Protection Equipment Demo Showcases Scores of Potential Fast-Track Procurement Items." Armed Forces Journal, November 1997, 20-21.
- Rosenblum, Deborah. "Implementation of U.S. Anti-Personnel Landmine Policy." Defense International Security Assistance Management Journal, Summer 1998, 96-98.
- Sinclare, Wayne A. "Answering the Landmine." Marine Corps Gazette, July 1996, 37-40.
- Supplee, Thomas Barry. "Not Without Risk: Operational Analysis of a Landmine Ban." Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998.

"Terrorism ... An Undeclared War." Defense, Issue 6, 1996, 17-25.

U.S. Army. Mine/Countermine Operations (FM 20-32) Washington, D.C.: 1998).

U.S. Department of State, Bureau of Political-Military Affairs. HIDDEN KILLERS  
1998, The Global Landmine Crisis. Washington: 1998.

U.S. Department of Defense. Department of Defense Directive Number 2000.12, DoD  
Antiterrorism /Force Protection (AT/FP) Program. Washington: 1999.

U.S. Department of Defense. Report to the Secretary of Defense on the Status of DoD's  
Implementation of the U.S. Policy on Anti-Personnel Landmines. Washington:  
1997.

Ward, Daniel. "Assessing Force Protection Risk." Military Review, November/December  
1997, 11-13.

Williams, Terry, Van. "Filling an Operational Requirement: The Nonlethal Approach."  
Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1998.

Yates, Donald R. "The Landmine Dilemma and the Role of the U.S. Government."  
Unpublished Research Paper, U.S. Army War College, Carlisle Barracks, PA: 1996.